

Occurrence Report

After 2017 Redesign

Portsmouth Decontamination and Decommissioning

(Name of Facility)

Environmental Restoration Operations

(Facility Function)

Portsmouth Gaseous Diffusion Plant

Fluor-BWXT Portsmouth, LLC

(Laboratory, Site, or Organization)

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Date: 03/29/2019

(Authorized Classifier (AC))

1. Occurrence Report Number: EM-PPPO-FBP-PORTSDD-2019-0001

Nuclear Criticality Safety Double Contingency Anomalous Condition

2. Report Type and Date: FINAL

	Date	Time
Notification:	01/24/2019	16:51 (ETZ)
Initial Update:	01/24/2019	16:51 (ETZ)
Latest Update:	01/24/2019	16:51 (ETZ)
Final:	01/24/2019	16:51 (ETZ)

Report Level: L

4. Division or Project: Process Building D&D Projects**5. Secretarial Office:** EM - Environmental Management**6. System, Bldg., or Equipment:** X-326**7. UCNi?:** No**Reviewed for Public Release:****8. Plant Area:** G4**9. Date and Time Discovered:** 01/09/2019 09:37 (ETZ)**10. Date and Time Categorized:** 01/11/2019 08:39 (ETZ)**11. DOE HQ OC Notification:**

Date	Time	Person Notified	Organization
NA	NA	NA	NA

12. Other Notifications:

Date	Time	Person Notified	Organization
01/11/2019	08:39 (ETZ)	Jeff Stevens	FBPORTS
01/11/2019	10:26 (ETZ)	Joel Bradburne	FBPORTS
01/11/2019	10:29 (ETZ)	Bobby D. Smith	FBPORTS

13. Subject or Title of Occurrence:Nuclear Criticality Safety Double Contingency Anomalous Condition

14. Reporting Criteria:

3C(4) - A deficiency in criticality safety analysis or degradation of a documented criticality control (or controls) such that adequate controls were not in place for a credible criticality accident scenario.

15. Description of Occurrence:

On January 9, 2019, at approximately 0937 hours, during a facility walk down, fifteen (15)

eight (8) inch seal exhaust pipes were found grouped together with no spacing as Category 1 (CAT 1) materials (no visible uranium and no hidden cavities); however, visible deposits were observed inside three (3) of the pipes meaning the pipes were misclassified and should have been identified as CAT 2 materials (items that have potential to contain significant uranium mass) which require certain minimum spacing. This resulted in the loss of one of two credited controls for double contingency. The Facility Manager entered an Anomalous Condition and requested Nuclear Criticality Safety (NCS) respond to assess. Items with visible uranium were removed and stored in compliance in a separate storage area. The Anomalous Condition was exited.

UPDATE 02/25/2019: During re-inspection other CAT 1 items additional piping found to be misclassified was appropriately dispositioned. NCS personnel have completed 100% inspection of the remaining unpackaged CAT 1 piping in X-326 and determined there was no credible criticality scenario for the conditions identified.

The contingency events for NCSE-PLANT048 Nuclear Criticality Safety Evaluation of Contaminated Metal credit the result of the visual inspection of each item on its surfaces, resulting in the uranium being distributed and a low uranium concentration for CAT 1 contaminated metal. Even though the process pipe will have some uranium entrained in the metal, this uranium would be distributed, and therefore of a low concentration if each pipe passes the visual inspection of its surfaces. If a CAT 2 item is misclassified and stored without spacing in a CAT 1 storage area or in a box, it will remain subcritical because the uranium mass/concentration of the CAT 1 contaminated metal is low so that the CAT 2 item is essentially isolated. Therefore, for a criticality to occur from this event multiple CAT 2 items would have to be mistakenly stored in a CAT 1 area and the multiple CAT 2 items would have to be stored adjacent to each other.

Calculations for an infinite planar array of pipes stacked 100 high sitting on a concrete floor indicate that the nominally empty pipes, all containing up to 30 g 235U /ft, are subcritical. Nominally empty pipes with up to 17.3 g 235U /ft for 6" pipe and 22.6 g 235U /ft for 8" pipe would meet a concentration of 0.002 235U g/g waste. Section 10.1 of NUREG-6505, specifically Lines 7-12 of Table 10.1-1, Extracted Nominal-soil (N-S) results, "The Potential for Criticality Following Disposal of Uranium at Low-Level Waste Facilities," demonstrates that 0.002 (g 235U / g fill) remains sub-critical for all moderation levels.

Credible failures to categorize pipes as CAT 1 instead of CAT 2 are within the scope of the evaluated credible upset conditions because, as stated above, 6" and 8" pipe up to a 100 high pipe stack, infinite in number in other directions, could all be as high as 30 g 235U/ft and still be subcritical (representing multiple CAT 2 storage with CAT 1 upsets).

Visible uranium is defined as uranium material beyond a fixed film or stain which is considered CAT 1. However, items where there is more than a film of material or the film is not fixed/adhered to the surface it is considered CAT 2. Some piping identified for this event may have been considered CAT 1 at the time of initial inspection, but conditions may have changed where flaking and rusting occurred.

16. Is Subcontractor Involved? No

19. Immediate Actions Taken and Results:

1/09/2019 (Wednesday)

- Problem report written.
- Facility Manager entered Anomalous Condition and boundary established to prevent entry.

1/10/2019 (Thursday)

- All identified pipes were removed and placed in an NCS-compliant condition in a separate area. Pipes were cleaned by Chemical Operations to CAT 1 or were placed in an existing compliant storage area.

1/11/2019 (Friday)

- NCS CAT 1 work paused in process buildings.
- A Fact Finding Meeting was scheduled.
- Initiated an ORPS Notification.

1/14/2019 (Monday)

- Conducted Fact Finding Meeting.
- Began extent of condition evaluation.

1/17/2019 (Thursday)

- Identified five additional pipes in four CAT 1 storage areas. All CAT 1 pipes in the storage locations were inspected. One area of palletized CAT 1 piping was from multiple systems.
- Facility Manager entered Anomalous Condition and established a boundary around each of the four areas.
- Inspected piping, removed the piping sections with visible uranium, and placed in compliance in a separate storage area.

1/18/2019 (Friday)

- Dispositioned the piping from 1/17/19. Removed the piping sections with visible uranium, and stored them in compliance in a separate storage area.
- Walked down North half of X-326 operations CAT 1 areas and identified more Seal Exhaust piping with visual uranium.
- Facility Manager entered Anomalous Condition and established a boundary. Inspected piping, removed the piping sections with visible uranium, and stored them in compliance in a

separate storage area.

1/19/2019 (Saturday)

- All 5 items/ 4 areas identified on ACR-FBP-PR-FY-0833 (Table 1) were closed.
- Walked down the remaining South Side of X-326 identifying 16 additional CAT 1 locations requiring visual inspections.
- Facility Manager entered Anomalous Condition and established boundaries.
- Removed the piping sections with visible uranium, and stored them in compliance in a separate area.

1/21/19 (Monday)

- Continued walk downs and identified ten additional suspect seal exhaust piping sections in CAT 1 areas.
- Facility Manager entered Anomalous Condition and established boundary.
- Removed the piping sections with visible uranium, and stored them in compliance in a separate area.

1/22/19 (Tuesday)

- Inspected over 300 pipes in CAT 1 areas with three failing visual inspection.
- Facility Manager entered Anomalous Condition and established a boundary.
- Removed the piping sections with visible uranium, and stored them in compliance in a separate area.

1/23/19 (Wednesday)

- Continued pipe inspection. Identified 13 pipes in CAT 1 areas with visible uranium.
- Facility Manager entered Anomalous Condition and established a boundary.
- Removed the piping sections with visible uranium, and stored them in compliance in a separate area.

1/24/19 (Thursday)

- All remaining pieces of CAT 1 items were dispositioned.
- Confirmed to be CAT 1 by NCS – or removed to CAT 2 storage.
- A total of 131 pieces had been moved to CAT 2 storage.
- The pieces varied from 1" – 8" diameter, from 1 – 5 foot long.
- No additional items were found.

2/25/19 (Monday) Update:

B-12 boxes previously filled with CAT-1 piping that will be transported to X-744G for verification of proper disposition and the inspection of suspect piping that was previously transported to the X-330 facility.

03/05/2019 (Tuesday)

- Anomalous Condition identified in X-330 Process Building due to two areas with three pallets each containing sections of seal exhaust pipe from X-326. Six pallets were inspected; one out of compliance item was identified and moved to storage.
- Anomalous Condition identified in X-744G from seal exhaust pipe from X-326 packaged in B-12 containers. Some of the B-12s were already in X-744G and the remaining were in the process of being moved to the X-744G for inspection.

20. ISM:

- 4) Perform Work Within Controls

21. Cause Code(s):

A3B1C01 - Check of work was LTA

->couplet - A4B3C05 - Insufficient number of trained or experienced workers assigned to task

A4B3C11 - Inadequate work package preparation

A3B3C04 - LTA review based on assumption that process will not change

22. Description of Cause:

Background

Process Building D&D began removing X-326 Seal Exhaust Piping back in May 2018. Piping was inspected and categorized as CAT 1 or CAT 2. CAT 1 items do not have potential to contain significant uranium mass. They have no visible uranium on them beyond a fixed film or stain or items from a non-fissile operation or items with hidden cavities from non-fissile material operations. CAT 1 do not require any NCS controls and have no special spacing, disposal or storage requirements. While CAT 2 items have the potential to contain significant uranium Mass and require Nuclear Criticality Safety Controls. These controls include two foot spacing and placing items in storage area.

During Cascade Operations, the Seal Exhaust System was comprised of pumping stations (three in X-326) and a building header system. Vacuum pumps located at the stations used Alumina Traps to absorb any UF₆ that might have been in nitrogen and dry air buffer gases coming from Compressor Seal before those gases were exhausted to atmosphere through the roof vents. The seal exhaust system provided the containment function of the UF₆ system. Pipe used for the system was black iron pipe that was not plated and it was painted blue to differentiate it from process gas pipe.

Removal of the seal exhaust piping was addressed by one work package. This work package

was reviewed to determine training requirements necessary for the removal of the piping. The work package included specific training for workers and required workers to complete the Deactivation Training Matrix. This matrix was composed of many modules, but did contain two modules specific to this event: NCSA/E-PLANT048.A07/E07 "Contaminated Metal," and Training Job Performance Measure (JPM) TA4579 Rev. 0 "Classification and Segregation of Contaminated Cascade Piping Segments and Small Components."

Training Module X04981 is classroom training on requirements and limitations of the NCSA/E-Plant048, Contaminated Metal, and requires a minimum of 80% on written exam. Module TA4579 is a Job Performance Measure (JPM). This module identifies completion of Module X04981 as a prerequisite training. Module TA4579 was developed specifically for Deactivation / D&D personnel and its purpose is for the trainee to demonstrate proficiency in classifying cascade piping and components per the requirements of NCSA/E-Plant048, Contaminated Metal. Proficiency is demonstrated to the evaluator by either live or photographed examples.

In the fact finding for this event a D&D supervisor discussed the general method of removal and categorization of piping. The supervisor would categorize each section of pipe as CAT 1 or CAT 2. Items identified as CAT 1 were grouped on pallets and placed in B-12 containers. Some items that were identified as CAT 2 required them to be cleaned by Chemical Operations personnel to allow them to then be categorized as CAT 1.

A3B1C01 – A3 – Human Performance; B1 – SKILL BASED ERROR; C01 – Check of work was LTA

Couplet Code: A4B3C05 – A4 – Management Problem; B3 – WORK ORGANIZATION & PLANNING LTA; C05 - Insufficient number of trained or experienced workers assigned to task
The work package for pipe cutting along with discussion with management identified five supervisors covered all of the seal exhaust pipe cutting evolutions. Two of five supervisors had not completed Module TA4579 Job Performance Measure (JPM) Rev. 0 "Classification and Segregation of Contaminated Cascade Piping Segments and Small Components." The Deactivation Craft Training Matrix did list all five supervisors. An independent check of training by deactivation group has a project support technician verify training of project workers daily. However, supervisors were not necessarily included on this verification of training.

A4B3C11 - A4 – Management Problem; B3 – WORK ORGANIZATION & PLANNING LTA; C11 - Inadequate work package preparation

The one work package for seal exhaust pipe cutting contains precautions and limitations along with action steps and notes directing an inspection of piping for categorization as CAT 1 or CAT 2. However, there was no hold point to confirm that inspection was performed or indicate who completed the inspection. FBP-WPC-GUI-00004 Planning Guide states that the intent of hold points is to ensure that a witness, inspection, or verification has been completed. Additionally, the work package does not specify who performs the pipe inspections for categorization. Apparently during the walk-down for this work package inspections were discussed, and supervision determined that a hold point was not needed since supervisors had agreed that they would be performing the inspection and categorization of piping as CAT 1 or CAT 2.

A3B3C04 – Human Performance LTA; B3- KNOWLEDGE BASED ERROR; C04 -
LTA review based on assumption that process will not change

Couplet Code: None

Supervisors at fact finding and later discussion with supervisors stated that they would not change their categorization on pipe they determined as CAT 1 based upon what they saw at the time the pipe was removed and inspected. Additional, discussion with Chemical Operator Supervisor confirmed that pipes D&D supervisors categorized as CAT 2 were cleaned to make them CAT 1 where possible. NCSA/E-PLANT048, Contaminated Metal has since been revised to address the change of condition which will not change the original classification. The NCSA was revised to include this statement and analysis determination "It is recognized that flaking of a fixed film of contamination or rusting of items may occur after classification. This is within the bounds of the classification and does not change the classification".

25. Corrective Actions

Local Tracking System Name: ICATS (Issues and Corrective Action Tracking System)

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|----|--|
| 1. | Ensure supervisors not trained to module TA4579 Job Performance Measure (JPM) Rev. 0 "Classification and Segregation of Contaminated Cascade Piping Segments and Small Components" are placed on training restriction. (A4B3C05, A3B1C01) (Process Building D&D) |
| | Target Completion Date: 04/30/2019 Tracking ID: 9459 |
- | | |
|----|---|
| 2. | Review training matrix to ensure deactivation workers and supervisors currently assigned to Process Building D&D have the appropriate level of training for conducting visual inspection and categorization of piping in accordance with NCSE-PLANT048. (A3B1C01, A4B3C05) (Process Building D&D) |
| | Target Completion Date: 05/30/2019 Tracking ID: 9460 |
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|----|---|
| 3. | Review and evaluate module TA4579 Job Performance Measure (JPM) Rev. 0 "Classification and Segregation of Contaminated Cascade Piping Segments and Small Components" for adequacy of qualification to perform visual inspection and frequency of training. (A3B3C04) (Process Building D&D) |
| | Target Completion Date: 05/30/2019 Tracking ID: 9461 |
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|----|---|
| 4. | Brief D&D planners on hold point requirements for inspections as stated in FBP-WPC-PRO-00004 Planning Work. (A4B3C11) (Infrastructure & Site Maintenance) |
| | Target Completion Date: 05/30/2019 Tracking ID: 9462 |

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|----|---|
| 5. | Revise work packages on removal of X-326 Seal Exhaust piping to ensure that a hold point is added for the qualified employee to perform and document inspection and categorization of seal exhaust piping. (A4B3C11) (Process Building D&D) |
| | Target Completion Date: 05/30/2019 Tracking ID: 9463 |
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|----|---|
| 6. | Complete extent of condition inspection for seal exhaust piping in B-12 containers that have been moved to X-744G. (Nuclear Operations) |
| | Target Completion Date: 11/15/2019 Tracking ID: 9464 |
- | | |
|----|--|
| 7. | A lessons learned will be issued on CAT 1/CAT 2 categorization along with necessary training requirements for the inspection. (Process Building D&D) |
| | Target Completion Date: 05/30/2019 Tracking ID: 9465 |

26. Lessons Learned:

Development of lessons learned is included as an action in the corrective action plan.

27. Similar Occurrence Report Numbers:

30. HQ Keyword(s):

01J-Inadequate Conduct of Operations - Criticality Procedure Noncompliance

01R-Inadequate Conduct of Operations - Management issues

12L-EH Categories - Nuclear Criticality Safety Concern

14E-Quality Assurance - Work Process Deficiency

31. HQ Summary:

On January 9, 2019, during a facility walk down, 15 eight-inch seal exhaust pipes were found grouped together with no spacing as Category 1 (CAT 1) materials (no visible uranium and no hidden cavities); however, visible deposits were observed inside three of the pipes, meaning the pipes were misclassified and should have been identified as CAT 2 materials (items that have potential to contain significant uranium mass) which require certain minimum spacing. This resulted in the loss of one of two credited controls for double contingency. The Facility Manager entered an Anomalous Condition and requested Nuclear Criticality Safety (NCS) respond to assess the situation. Items with visible uranium were removed and stored in compliance in a separate storage area. The Anomalous Condition was exited. The cumulative total of the residual material inside all the pipes was less than 1 liter of material.